DOCUMENT RESUME

ED 061 301 TM 001 469

TITLE	Nut Sorter I 8-10.25 -- Technical Report on Standardization of the General Aptitude Test Battery.
INSTITUTION	Manpower Administration (DOL), Washington, D.C. U.S. Training and Employment Service.
REPORT NO	TR-S-96
PUB DATE	Dec 56
NOTE	8p.
EDRS PRICE	MF-$0.65 HC-$3.29
DESCRIPTORS	*Aptitude Tests; *Cutting Scores; Evaluation Criteria; Food Processing Occupations; Job Applicants; *Job Skills; Norms; Occupational Guidance; *Personnel Evaluation; *Sorting Procedures; Test Reliability; Test Validity
IDENTIFIERS	GATB; *General Aptitude Test Battery; Nut Sorter

ABSTRACT

The United States Training and Employment Service General Aptitude Test Battery (GATB), first published in 1947, has been included in a continuing program of research to validate the tests against success in many different occupations. The GATB consists of 12 tests which measure nine aptitudes: General Learning Ability; Verbal Aptitude; Numerical Aptitude; Spatial Aptitude; Form Perception; Clerical Perception; Motor Coordination; Finger Dexterity; and Manual Dexterity. The aptitude scores are standard scores with 100 as the average for the general working population, and a standard deviation of 20. Occupational norms are established in terms of minimum qualifying scores for each of the significant aptitude measures which, when combined, predict job performance. Cutting scores are set only for those aptitudes which aid in predicting the performance of the job duties of the experimental sample. The GATB norms described are appropriate only for jobs with content similar to that shown in the job description presented in this report. A description of the validation sample is included. (AG)

ED 061301

TECHNICAL REPORT

ON

STANDARDIZATION OF THE GENERAL APTITUDE TEST BATTERY

FOR

NUT SORTER I 8-10.25

B-350 or S-96

U.S. DEPARTMENT OF HEALTH,
EDUCATION & WELFARE
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T: C: 469

U. S. Employment Service in
Cooperation with
California State Employment Service

U. S. DEPARTMENT OF LABOR
Bureau of Employment Security
Washington 25, D. C.
December 1956

GATB #2110
Winter 1955

STANDARDIZATION OF THE GENERAL APTITUDE TEST BATTERY FOR NUT SORTER I 8-10.25

B-350 or S-96

Summary

The General Aptitude Test Battery, B-1002A, was administered to a sample of 74 women employed as Nut Sorters at the California Walnut Growers Association, Los Angeles, California. The criterion consisted of rank order supervisory ratings. On the basis of mean scores, job analysis data, and their combined selective efficiency, Aptitudes F-Finger Dexterity and M-Manual Dexterity were selected for inclusion in the test norms.

GATB Norms for Nut Sorter I 8-10.25 - B-350 or S-96

Table I shows, for B-1001 and B-1002, the minimum acceptable score for each aptitude included in the test norms for Nut Sorter I 8-10.25.

TABLE I

Minimum Acceptable Scores on B-1001 and B-1002 for B-350 or S-96

B-1001			B-1002		
Aptitude	Tests	Minimum Acceptable Aptitude Score	Aptitude	Tests	Minimum Acceptable Aptitude Score
F	CB-1-O CB-1-P	80	F	Part 11 Part 12	75
M	CB-1-M CB-1-N	80	M	Part 9 Part 10	80

Effectiveness of Norms

The data in Table IV indicate that 6 of the 10 poor workers, or 60 percent of them, did not achieve the minimum scores established as cutting scores on the recommended test norms. This shows that 60 percent of the poor workers would not have been hired if the recommended test norms had been used in the selection process. Moreover, 56 of the 60 workers who made qualifying test scores, or 93 percent, were good workers.

TECHNICAL REPORT

I. Problem

This study was conducted to determine the best combination of aptitudes and minimum scores to be used as norms on the General Aptitude Test Battery for the occupation of Nut Sorter I 8-10.25.

II. Sample

The General Aptitude Test Battery, B-1002A, was administered to a total of 98 Nut Sorters I 8-10.25, who represented approximately 78 percent of the total day shift employment in this occupation with the California Walnut Growers Association at Los Angeles, California. The workers were tested over a four-day period during the week of November 21, 1955. Workers were taken from the grading belts in groups of four to make up 12 workers for each group tested. The foreman selected whom he considered to be good, fair and poor workers from the total employment of 125 on the day shift to make up the group of 98 who reported for testing. Twenty workers were eliminated from the sample because they were unable to understand test instructions. Three cases were dropped because of improper marking of paper-and-pencil tests, and one case was excluded because of poor vision. The final sample, therefore, consisted of 74 female workers.

New workers were selected on the basis of a personal interview and the use of a Bausch-Lomb Occupational Vision test with the Ortho-Rater. No experience was required. Ability to speak, read and write English was regarded as the minimum educational requirement and workers between the ages of 18 and 40 were preferred. The experimental sample contains a number of workers hired on this basis. Also included in the sample are older workers who were hired during the period of acute labor shortages in World War II with no restrictions on age, experience or education and without the use of the Bausch-Lomb test.

Training consists of on-the-job instruction under close supervision for approximately one week. New workers are first shown color samples and defective materials to be sorted and are then placed on a grading belt moving at slow speed until they are considered ready to work on a belt with more experienced workers. Time to reach normal production varies from two days to two weeks.

Table II shows the means, standard deviations, ranges, and Pearson product-moment correlations with the criterion for age, education and experience.

TABLE II

Means (M), Standard Deviations (σ), Ranges, and Pearson Product-Moment Correlations with the Criterion (r) for Age, Education and Experience

Nut Sorter I 8-10.25

N = 74

	M	σ	Range	r
Age (years)	34.5	9.4	18 - 65	-.159
Education (years)	8.1	2.1	4 - 13	-.033
Experience (months)	30.5	34.3	1 - 200	.162

The data in Table II indicate that there is no significant correlation between age, education or experience and the criterion. The elimination of one case with 200 months of experience would lower the range to 1-97 months. The total number of months of experience in the occupation was based on the number of months worked each season, i.e., an individual who worked an average of 8 months each season for 7 seasons would be credited with 56 months of experience.

III. Job Description

Job Title: Nut Sorter I 8-10.25

Job Summary: Grades walnut meats for condition or color by sorting out proper color desired, using thumb and index finger of each hand. Removes pieces of shell, spoiled nut meats and other extraneous materials.

Work Performed: Performs one or more of the following tasks in the sorting of walnut meats.

Grades and sorts for condition only: Picks up off-grade shelled walnuts and pieces of shell or foreign objects from conveyor belt. Uses thumb and index finger of each hand in a twisting motion to drop nut meats into palms of hands and to "swing out" (toss off) bits of shell into one of three sorting bins labeled "off-grade," which are located in front of the worker and centered over the conveyor belt. When palms are filled, tosses selected off-grade nut meats into proper bin. Repeats process, occasionally spreading the nut meats and shells with loose fingers of either hand. (Note: This worker, known as the hopper girl, while required only to sort off-grade nut meats and bits of shell, must do so very rapidly in order to keep pace with the continuous flow of nuts from the hopper onto the conveyor belt.)

Grades and sorts for lighter shades of walnut meats: Picks up "diamonds" (lightest grade or shade of nut meats), or "emeralds" (next darkest grade) from conveyor belt, using thumb and index finger of each hand in a twisting motion to drop meats into palms and to "swing out" some of the off-grade meats that have been missed by hopper girl. Tosses handfuls of picked meats forward into properly labeled bins, depending on whether she is picking halves or pieces, and repeats process. (Works at a slower speed than hopper girl but is required to grade according to color, whereas hopper girl is not.)

Grades and sorts for darker shades of walnut meats: Picks up "suntans" (next darkest grade of marketable walnuts) and "blacks" (black walnut meats that are marketable) from conveyor belt, using thumb and index finger of each hand in a twisting motion to drop meats into palms. When palms are full, tosses nuts forward into proper bins. Occasionally "swings out" some off-grade meats or bits of shell. (Works at a slower pace than hopper girl, but is required to grade according to color, whereas hopper girl is not.)

Grades for any shade of marketable walnuts: Picks up from conveyor belt marketable shelled nuts that have been overlooked by other workers (diamonds, emeralds, suntans, blacks), using thumb and index finger of each hand in a twisting motion to drop meats into palms. Tosses meats into proper bins when palms are filled. Occasionally "swings out" off-grade nuts, bits of shell and foreign matter that were missed when sorter's hands were partially filled with graded nuts. (Works at end of grading belt at a somewhat slower pace than other sorters but is required to select and pick up a variety of shades, depending on the volume of each grade that appears before her on the belt, as well as to "swing out" off-grade nuts.)

IV. Experimental Battery

All of the tests of the GATB, B-1002A, were administered to the sample group.

V. Criterion

The criterion consisted of supervisory ratings in rank order prepared by the production foreman. Workers were rated on their performance at the completion of a minimum of two weeks' work and were re-rated after a time interval of 18 days. The foreman rating the workers was not aware that he would be required to prepare a second set of ratings until the time interval had elapsed. The foreman prepared rank order ratings on 93 of the 98 workers whom he had sent to be tested. Since the final sample consisted of 74 workers, the ranks were determined from their relative positions in the list of 93 workers. The second set of ratings was prepared in a similar manner. The ranks established on each set of ratings were converted to linear scores and a reliability coefficient (Pearson product-moment correlation) of .94 was obtained between the first and second ratings of the foreman. The final criterion consisted of the average of the two sets of linear scores.

VI. Statistical and Qualitative Analysis

Table III shows the means, standard deviations and Pearson product-moment correlations with the criterion for the aptitudes of the GATB. The means and standard deviations of the aptitudes are comparable to general working population norms with a mean of 100 and a standard deviation of 20.

TABLE III

Means (M), Standard Deviations (σ), and Pearson Product-Moment Correlations with the Criterion (r) for the Aptitudes of the GATB

Nut Sorter I 8-10.25

N = 74

Aptitudes	M	σ	r
G-Intelligence	75.1	11.3	-.091
V-Verbal Aptitude	81.3	11.7	-.054
N-Numerical Aptitude	68.6	15.1	-.019
S-Spatial Aptitude	82.2	12.4	-.155
P-Form Perception	84.8	16.5	.126
Q-Clerical Perception	85.2	11.7	.134
K-Motor Coordination	96.9	18.0	.049
F-Finger Dexterity	97.8	20.1	.005
M-Manual Dexterity	101.4	18.8	.154

The statistical results were interpreted in the light of the job analysis data. The job analysis indicated that the following aptitudes measured by the GATB appear to be important for this occupation:

Motor Coordination (K) - required in coordinating hand and finger movements in picking up and "tossing off" appropriate material.

Finger Dexterity (F) - required in picking up nut meats and bits of shell and in "tossing off" foreign objects with fingers while hands are partially filled.

Manual Dexterity (M) - required in twisting and turning motions to drop nut meats into palms and in tossing accumulated handfuls into proper bins.

The highest mean scores in descending order of magnitude were obtained for Aptitudes M, F and K, respectively. All of the aptitudes, except Aptitude F have standard deviations of less than 20. Aptitude G has the lowest standard deviation.

For a sample of 74 cases, correlations of .298 and .229 are significant at the .01 level and the .05 level of confidence, respectively. None of the aptitudes correlates significantly with the criterion. This may be due in part to the fact that the proportion of poor workers in the sample was reduced when it became necessary to exclude 20 workers because of difficulty in understanding test instructions. Inspection of the foreman's original ratings indicated that the majority of these workers had been rated in the lowest third of the ranks for the 93 workers. It is likely that exclusion of these workers restricted the range of ability which tends to depress the obtained correlation corfficients.

Aptitudes K, F and M were considered for inclusion in the test norms on the basis of their relatively high mean scores and the job analysis data. Tetrachoric correlations with the criterion were computed for several sets of trial norms consisting of various combinations of Aptitudes K, F and M and appropriate cutting scores. It was found that Aptitude K tends to lower the selective efficiency of the norms when combined with Aptitude F or M or both. Therefore, Aptitude K was not included in the final test norms. The cutting scores for Aptitudes F and M were set at one standard deviation below their respective mean scores and rounded to the lower adjacent five-point score levels. Setting cutting scores at these levels yielded the best selective efficiency for the norms and resulted in scores of 75 and 80 for Aptitudes F and M, respectively.

VII. Concurrent Validity of Norms.

For the purpose of computing the tetrachoric correlation coefficient between the test norms and the criterion and applying the Chi Square test, the criterion was dichotomized at the point designated by the foreman as the demarcation point between acceptable and marginal workers. On this basis, only ten workers, or 14 percent of the sample, were placed in the low criterion group.

Table IV shows the relationship between test norms consisting of Aptitudes F and M and cutting scores of 75 and 80, respectively, and the dichotomized criterion for Nut Sorter I 8-10.25. Workers in the high criterion group have been designated as "good workers" and those in the low criterion group as "poor workers."

TABLE IV

Relationship between Test Norms Consisting of Aptitudes F and M with Critical Scores of 75 and 80, Respectively, and the Dichotomized Criterion for Nut Sorter I 8-10.25

N = 74

	Non-Qualifying Test Scores	Qualifying Test Scores	Total
Good Workers	8	56	64
Poor Workers	6	4	10
Total	14	60	74

$r_{tet} = .74$ $\quad X^2 = 9.813$

$\sigma_{r_{tet}} = .26$ $\quad P/2 < .005$

The data in the above table indicate a high and significant relationship between the test norms and the criterion for this sample.

VIII. Conclusions

On the basis of mean scores, job analysis data and their combined selective efficiency, Aptitudes F and M with minimum scores of 75 and 80, respectively, are recommended as B-1002 norms for the occupation of Nut Sorter I 8-10.25. The equivalent B-1001 norms consist of F-80 and M-80.

IX. Determination of Occupational Aptitude Pattern

When the specific test norms for an occupation include two aptitudes, only those occupational aptitude patterns which include the same two aptitudes with cutting scores that are within 10 points of the cutting scores established for the specific norms are considered for that occupation. Three of the existing 22 occupational aptitude patterns meet these criteria for this study. These occupational aptitude patterns and their B-1002 norms are OAP-10, G-75, F-75 and M-80; OAP-16, P-75, F-80,and M-80; and OAP-17, K-85, F-80 and M-80. The selective efficiency of each of these OAP's for this sample was determined by means of the tetrachoric correlation technique. A significant relationship was obtained only between OAP-16 and the dichotomized criterion. A tetrachoric correlation of .47 with a standard error of .23 was obtained, which indicates a significant relationship between OAP-16 and the criterion for this experimental sample. The proportion of the sample screened out by OAP-16 was .43, which is within the required range of .10 to .60. Therefore, it is recommended that OAP-16 be used in counseling for the occupation of Nut Sorter I 8-10.25.